I.O.S.

RRS JOHN MURRAY CRUISE 15/75

21 OCTOBER–4 NOVEMBER 1975

SANDWAVE RESEARCH

CRUISE REPORT No 40

1975

NATURAL ENVIRONMENT RESEARCH COUNCIL

INSTITUTE OF OCEANOGRAPHIC SCIENCES

RRS JOHN MURRAY CRUISE 15/75

21 October–4 November 1975

Sandwave Research

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D N Langhorne
Institute of Oceanographic Sciences
Crossway
Taunton, Somerset

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LIST OF SHIP'S OFFICERS

Captain A Justen
1st Mate D Coverdale
2nd Mate P Tilbury
3rd Mate W Austin
1st Engineer A Coombes
2nd Engineer J Clarke
3rd Engineer J Richards

LIST OF SCIENTISTS TAKING PART

D N Langhorne (Senior Scientist)	22 October–1 November
P J Hooper	(20 October–24 October (20 October–1 November
E J Moore	22 October–26 October
R H Wilkinson	22 October–26 October
Mrs J A Musson	23 October–25 October
J O Malcolm	24 October–25 October
R L Cloet	28 October–1 November
A J Marks	28 October–1 November

External Staff:

P Bohill (Contract Diver)	24 October–25 October

OBJECTIVES

1. To carry out studies of sandwaves and associated dune bed forms in the Skerries Bank area of Start Bay.

2. To carry out a detailed bathymetric survey of sandwaves in the South Sandettie Bank area.

3. To carry out trials with the EG & G sonar in a vertical tow mode.

4. To carry out sonar surveys off Bournemouth and Totland Pier.

5. To continue operating trials with Rangemaster relative positing system.

ITINERARY

Monday 20 October — P J Hooper, E J Moore and C N Puckett drove to Barry with IOS (T) research equipment. PJH and EJM remained on board whilst CNP returned with transport to Taunton.

Tuesday 21 October — 0900 Sailed from Barry. Weather conditions were good until Lands End, then rough seas generated by Force 6 winds were encountered.

Wednesday 22 October — Arrived at Dartmouth at 2000 (original ETA 1200). D N Langhorne and R H Wilkinson joined the ship.

Thursday 23 October — Strong SE winds still persisted and sea conditions were considered too rough for research purposes.
am – Carried out trials with (a) the ORE sidescan sonar, (b) the EG & G sonar in a vertical mode, (c) Echo sounder for Bar checking with an IOS (T) Dexion/Neoprene frame, and (d) digitising of echo sounding depths and recording on the Decca Maglog.
pm – Drive to Start Point Lighthouse to inspect the Waverider recorder (10 ft waves had been recorded on the previous day).
Late pm – Mrs Musson joined the ship.

Friday 24 October — J O Malcolm and P Bohill (Divers) joined the ship.
0915 sailed from Dartmouth. Checked Decca stability on the Bell buoy and then proceeded to the dune study area to lay a buoy as a marker for the divers, the position of the buoy being based upon sonar data (see appendix 1).
While the divers were working from the inflatable dinghy attempts were made to carry out accurate sonar and echo sounding surveys of selected parts of the bank. Only poor results were obtained on account of the Decca receiver (linked to the ship's Decca track plotter) sticking at whole lane intervals. The 3rd Mate, EJM and P Bohill, were despatched in inflatable dinghy, to Dartmouth to arrange for a Decca Engineer to visit the ship.
1800 Abandoned attempts to carry out sonar survey and returned to Dartmouth.

Saturday 0800 Sailed from Dartmouth.

25 October 0930 Recommenced sonar survey of dunes on the Skerries Bank. Despite the visit of the Decca Engineer in the previous evening the Decca still failed to operate satisfactorily. Laid a buoy for divers in an area of large dunes (8m wavelength) and thence a second buoy in area of small dunes (1m wavelength approx.). See Appendix 1 for diver's report.

1700 Made observations of short wavelength dunes using underwater TV with the camera operated by divers.

1800 Returned to Dartmouth, where the Decca Engineer again visited the ship.

JOM, P Bohill and Mrs J Musson left the ship.

Sunday 0730 Sailed from Dartmouth (Decca performing well). Carried out

26 October detailed sonar survey of dune study area on the Skerries Bank and thence echo sounding traverses across the major sandwaves.

1700 Returned to Dartmouth at the end of daylight because of the dangers of snagging the EG & G sonar transducer on crab pot float ropes.

RHW and EJM left the ship, PJH joined the ship.

Monday 0700 Sailed from Dartmouth. Carried out sonar survey (with

27 October recording on Magtape) of the dune research area on the Skerries Bank.

1500 Sonar survey completed. Proceeded to a position east of Start Point to recover a float laid on a previous occasion.

1530 Sailed for Margate Roads.

Tuesday On passage.

28 October 1600 Arrived at Margate Roads. Set up HiFix receivers (S Rijnmond Chain).

1800 Landed to pick up R L Cloet and A J Marks and a Decca Engineer.

1900 RLC and AJM arrived at Margate.

2000 Returned to the ship (Decca Engineer failed to arrive).

Wednesday 0715 Sailed from Margate Roads. Sea conditions calm. Visibility

29 October less than 2 cables.

0900 Locked in HiFix at Tongue Tower and sailed for Sandettie area.

The fog cleared by midday.

1205 Checked Hi-Fix co-ordinates on Sandettie SW buoy and started close line (13.5m) bathymetric survey of the sandwave area to the south of Sandettie Bank. Seven good lines completed by dusk when HiFix instability became evident on pattern I. (Pattern rolling by up to 0.10 lanes which was equivalent to the required line spacing.) Despite the HiFix instability the survey was continued until 2130 at which time it was considered that the data being collected was of little value.

2200 Anchored for the night off Sandettie Bank.

Thursday 30 October

0800 Locked in HiFix at Sandettie SW buoy. Recommenced close line echo sounding survey. Lowered the outboard MS36 transducer an addition foot into the water to reduce aeration. Carried out a bar check and sound velocity profile.

Echo sounding survey continued until 1530 at which time the HiFix instability was too serious for close line survey operations.

Started EG & G sonar survey of the main sandwave area.

1735 HiFix lost lock. Recovered sonar and proceeded to anchorage off Sandettie Bank.

Friday 31 October

0700 Sailed from anchorage to Sandettie sandwave area.

0930 Completed echo sounding survey and commenced sonar survey.

1430 Completed sonar survey. Proceeded to Margate Roads.

Late pm Started Rangemaster trials.

Saturday 1 November

Continued Rangemaster trials using three seabed transponders, in conjunction with 'vertical-tow' sonar trials.

1215 IOS (T) scientific party landed at Margate to return to Taunton by Land Rover. RRS JOHN MURRAY sailed on passage for Barry.

NARRATIVE

1. SANDWAVES AND ASSOCIATED DUNE BED FORMS IN START BAY

In order to make a start at assessing the repeatable accuracy of Decca in Start Bay the position (flood and ebb) of the Bell buoy at the NE end of the Skerries Bank was recorded each day as opportunity permitted.

A primary dune study area was established in Start Bay based upon sonar data obtained during RV EDWARD FORBES of August and September 1975 together with sonar data from the current cruise. In this area dunes with wavelengths of approximately 5m and discontinuous crest lines occur in the deeper water off the bank. Short wave length dunes (1m wavelength approx.) occur associated with the large sandwaves on the east side of the Bank, whilst large dunes (8m wavelength approximately) occur in the fine sand on the top and landward side of the bank. Preliminary analysis of the sonar data gives no evidence of dune bed forms in the area between the short wavelength dunes and the 8m wavelength dunes on top of the bank. This is in contrast with the August data in which a transition of wavelengths was indicated. Multiple crests were also detected on some of the large dunes which may be a result of the SE winds which had been blowing for two days preceding the observations.

Divers carried out preliminary observations in order to equate visual observations with those of sonar.

The same area of seabed was surveyed by sonar on four successive days in order that short period changes may be identified. These records will also be compare with those obtained in August 1975.

2. BATHYMETRIC SURVEY OF A SANDWAVE FIELD SW OF SANDETTIE BANK

A close line (13.5m) echo sounding survey was carried out of the main sandwave area to the SW of Sandettie Bank. The object of this survey was to obtain data for comparison with a similar survey carried out by HMS Fox in March 1975. Horizontal position control was obtained by South Rijnmond HiFix chain. (frequency 1934.55 kHz) by courtesy of the Hydrographic Department MOD.

Depth was obtained using an MS36 echo sounder with outboard transducer. Owing to this method of deployment of the transducer it was not possible to digitise and record the echo sounding depth by Decca Maglog. HiFix positions were recorded on tape every second whilst a print out was obtained every 30 seconds.

During Decca daylight hours (approximately 0800–1530) it was possible to run survey traverses across the sandwave area at an approximate spacing of 0.10 lanes (13.5m). After 1530 hours it became increasingly difficult to maintain the required course and pattern fluctuations made the recorded position data of doubtful value. Despite the resulting short working day the survey was completed.

A sonar survey was also carried out covering the sandwave area. The line orientation was at approximately 45° to the sandwave crests with a line spacing of 250 metres (Range scale 154m). The sonar data was recorded on Mag tape.

3. TRIALS WITH THE EG & G SONAR IN A VERTICAL MODE

The reason for carry out these trials is to obtain accurately controlled sonar data, by which the position of the transducer is known relative to the ship's Decca (or HiFix) aerial (or electric centre).

For these trials the Port transducer was removed from the EG & G sonar fish and mounted in a faired acoustically transparent plastic tube and attached to the MS47 Transit sonar trandsucer. The latter transducer only acted as a rigid mounting for the EG & G transducer. The electric leads to and from the transducer were attached to the MS47 transducer pole and taken in board to the Sonar preamplifiers and thence to the recorder.

Successful trials were carried out in Dartmouth Harbour whilst the ship remained at anchor on the 23 October. Further underway trials were carried out in Margate Roads on 1 November. In these latter trials it was established that good records could be obtained at normal sonar speeds (4–5 kts) with the transducer tilted down at approximately 20°. (At small angles considerable interference occurs.) Further development will be carried out.

4. SONAR SURVEYS OF BOURNEMOUTH AND TOTLAND PIER

Owing to the day and a half lost at the beginning of the cruise and the disappointing results initially obtained in Start Bay, due to the Decca failure, this part of the cruise was cancelled.

5. FURTHER TRIALS WITH THE RANGEMASTER RELATIVE POSITIONING SYSTEM

Because it was feared that weather conditions might have made the Sandettie sandwave survey impossible, the Rangemaster was taken aboard to provide for an alternative exercise in sheltered waters.

The equipment had been collected from the factory on the way to the ship, and it became evident that it was not in a serviceable condition. A J Marks was able to make some temporary modifications after a ship to shore call to Sonardyne, but it remained impossible to check the input to the tape recorder.

Checking out one transponder frequency and tuning all channels to it gave realistic and reasonably consistent ranges, but also provided evidence of a certain amount of instrumental noise, which had not been in evidence on previous trials. On one channel there were signs that the IF tuning had become maladjusted. Without documentation this could not be remedied and hence only three channels could be used.

A four track tape recorder together with an oscilloscope to monitor inputs and outputs were connected without any apparent ill effects. About twenty minutes of recording were taken. The signals recorded were a voice log, a 1 kHz reference frequency, a transmitter trigger pulse, and a wide band preamplified hydrophone signal.

On the basis of the above it was agreed, time and weather permitting, that an attempt would be made to record a survey network of three transponders laid out in a 500m triangle. This attempt was made on the morning of 1 November 1975. The Decca co-ordinates of the network, and a sound velocity profile were noted. As the survey proceeded it became clear that the Rangemaster was not at its most efficient. Some replies were not displayed and others were incorrect. By observation of the monitor oscilloscope it was thought that the fault was in the processing rather than the input signal, so about forty five minutes of potentially useful tape recording was taken. About 11 am the trials were

discontinued, and the three transponders recovered. It was decided to return the equipment to the manufacturer to re-establish optimum performance.

COMMENTS

WEATHER

A day and a half was lost at the beginning of the cruise due to strong SE winds (half a day being lost whilst the ship was on passage, while the following day the ship remained in Dartmouth Harbour).

For the period 24-30 October a region of high pressure centred over Northern Europe persisted. This resulted in light airs and good sea conditions for that period. Accompanying these conditions there tended to be poor visibility including fog (visibility less than 2 cables on the morning of 29 October). As a result of fog some two hours were lost.

SHIP AND SHIP'S EQUIPMENT PERFORMANCE

On the first working day (24 October) whilst working with the Navigational Decca considerable difficulty was experienced in maintaining a steady course on the Decca track plotter. Inspection of the resulting tracks indicated that the Deccometers were sticking on the whole lane values. This fault was only rectified after two visits from a Decca Engineer.

Apart from this technical failure the ship and its equipment performed well. A high degree of co-operation and goodwill existed between the ship's company and the scientific party.

APPENDIX

DIVE REPORTS

Start Bay 24 October 1975

Dive 1 - (Red 9.36 Purple 53.30) Malcolm 12.45–13.07

Bottom at shot line 10m: visibility 2m: slight current to S: medium sand with comminuted shell.

Swam south over many small dunes, asymmetric north, 7m wavelength, 30 cm height. Continued down stoss slope to 25m depth then left bottom to stay at 25m for ease of timing. Drifted south onto lee slope of large sandwave at 15m depth on ascent.

Dive 2 - Bohill 13.28–13.46

Swam north from same shot line position into stronger current. Dunes initially 1m wavelength, 30 cm height then 7m wavelength with increased depth. Six dunes of 3m wavelength and 60 cm height were followed by a flat bottom at 23m depth.

COMMENTS - This sandwave was obviously much modified, unlike the 12m lee slope dived on 25.8.75. It would appear from Dive 1 that the sandwave to the south of the shot line was a (the?) well defined one, as the trough was greater than 25m depth compared with a maximum of 23m to the north.

Start Bay 25 October 1975

Dive 1-(Red 6.28 Purple 50.42) Malcolm and Bohill 12.27–12.48

Bottom at shot line 12.5m: visibility 7m: slack water: rippled medium sand, clean, little shell.

Swam north over six dunes, asymmetric north, 12m wavelength, 30cm height, sand grey at 15cm below surface on crests of dunes denoting little recent movement.

Dive 2 - (Red 8.41 Purple 52.48) Malcolm and Bohill 13.24–13.35

Bottom at shot line 12.5m: slight current to south: very shelly medium–coarse sand.

Swam south–west over small dunes (large ripples) 45cm wavelength, 6–8cm height becoming larger and more regular 130 cm wavelength, 10cm height.

Dive 3 - Malcolm and Bohill 13.40–13.50
Sample taken through the crest of one of these small shelly dunes using new box sampler.

Dive 4 - (Red 8.45 Purple 51.82) Malcolm and Bohill 16.50–17.05
Showed sediment movement over small dunes, using low light TV camera, to those on board RV JOHN MURRAY at anchor. Dunes were asymmetrical south and rather disordered. The current was almost too strong to hold position using the camera.

COMMENTS - The first two dives were undertaken on sidescan sonar evidence. Dive 1 did not appear to be on the topography as shown on the sidescan record although the position was marked by buoy. There may be forms of structure which are not apparent to a diver in poor visibility but show up well on sidescan (and vice versa). Dive 2 topography, however, did show what appeared on sidescan and it was interesting to note the minimum size which could be reproduced on the trace and the effect made by the change in lithology.

The diver box sampler, used for the first time, proved useful. A good sample was obtained although the coarse shelly sand is difficult to penetrate and is loosely packed at the surface, especially on the crests of dunes. Two hammers wielded by two divers, would have given a more even penetration but the impregnated sample showed good undisturbed cross laminations. The time taken (10 minutes) was reasonable, considering the above circumstances, and could be improved upon with practice.

The TV "session" proved very interesting to those on board RV JOHN MURRAY and a good camera technique was evolved whilst on the bottom and as a result of comments when the divers surfaced.